The Effect of Resin on the Property of Red Fluorescent Inkjet Ink

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Abstract

With the development of digital printing, digital anti-copy technology is also in constant development. At present, Fluorescent inkjet ink is one of the digital anti-copy technologies that used widely abroad. Fluorescent inkjet ink is composed of solvent, resin, phosphor, assistant agent and so on, and resin is the main component in the fluorescent inkjet ink, which has an important effect on the luminescent property and various physical properties. In order to research and develop the fluorescent inkjet ink, fluorescent inkjet ink samples had been prepared by changing the content and type of resin, and the several important properties which include luminescent property, viscosity , surface tension etc were tested, and then the optimal content and type were determined. The effect of resins on the significant properties of the fluorescent inkjet ink had been studied. At last, the prints that obtained by using ink-jet press and red Fluorescent Inkjet Ink have a good print quality.

1. Introduction

Ink-jet printing as a new digital printing technology has been more and more attention in recent years. And the application field is increasing, mainly used in digital painting, digital printing, digital photo printing and family and office output, etc[1]. Fluorescent inkjet ink is a relatively typical digital anti-counterfeiting technology currently. Under the UV light source, the prints have several characteristics, such as simple operation, low cost, easy to conceal, bright in color, convenient inspection and so on. As an important component of the Fluorescent inkjet ink, the choice of resin is particularly important. In this dye and solvent system, it can improve the wetting and penetrating power of ink[2]. One function of resin is to ensure the solubility with solvent, and another is make ink has good film-forming properties. In this paper, fluorescent inkjet ink samples had been prepared by changing the content and type of resin, and the several important properties which include luminescent property, viscosity, surface tension etc were tested, and then the optimal content and type were determined.

2. Experiment

2.1 Raw materials

Resin: acrylic resin AZ-5391、acrylic resin 8、epoxy resin EP、vinyl-acetate copolymer CP-430、polyurethane resin PU
Solvents: ethyl acetate
Dye: red phosphor
Additive: pH regulator

2.2 Apparatuses

Surfance tension apparatus,K100,Kruss
FluorescenceSpectrometer,RF5301PC, Japan
Rheometer, AR2000ex, TA, USA
Ultraviolet Spectrophotometer,UV-2501PC,Japan
Digital inkjet press, SD9900, China

3. Result and discussion

3.1 The effect of the resins on the luminous intensity of Fluorescent inkjet ink

(1) The effect of the different resins on the luminous intensity of Fluorescent inkjet ink

The ink samples is respectively prepared by selecting acrylic resin AZ-5391、acrylic resin 8、epoxy resin EP、vinyl-acetate copolymer CP-430 and polyurethane resin PU(respectively instead with R1、R2、R3、R4 and R5), and the luminous intensity of ink samples are tested, as show in figure1.

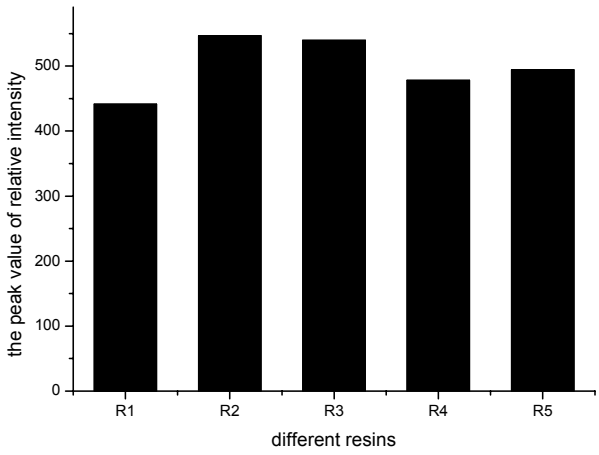

Figure1. The effect of the different resins on the luminous intensity of Fluorescent inkjet ink

From the Figure1, luminous intensity of R2 is the highest of all, R1 is lowest, and the other three resins are in the middle. Both R1 and R2 have the similar chemical structure, belong to acrylic resin, but luminous intensity is entirely different. To R1, the main reason of lowest luminous intensity is –COOH can offset and inhibit the generation of fluorescence. To R2, although –COOH exist, when red phosphor dissolved in the resin solution, the force that generated can strengthen luminous intensity, and played a major role. TO R3, The structure of the polyurethane is very symmetrical, and this structure usually contains fluorescent reinforcing group, such as benzene rings (group)、—NH2 and so on. The existence of such groups can enhance luminous intensity. The molecular structure of the epoxy resin R5 contains lively epoxy groups in the end or middle of the chain and it can also enhance luminous intensity. The chemical structure of R5 has not this special group, so the luminous intensity is not high. Therefore, because of highest luminous intensity, R2 is the best choice.

(2) The effect of the different quantity of resin on the luminous intensity of Fluorescent inkjet ink

The ink samples are prepared by selecting R2 and changing its quantity in ink system 8%、9%、11%、12%、14%、16%, and the luminous intensity of ink samples are tested, as show in figure2.

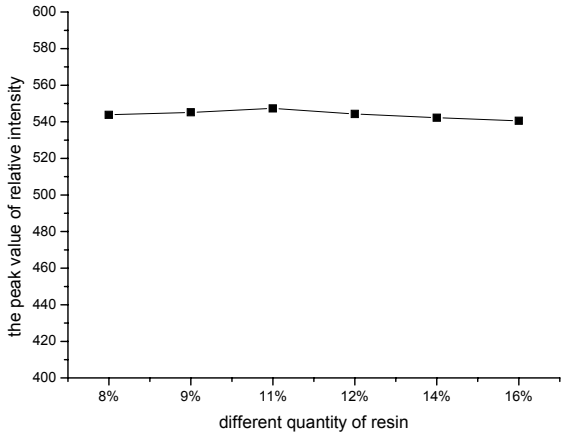

Figure2. The effect of the different quantity of resin on the luminous intensity of Fluorescent inkjet ink

The figure2 show that along with the increase of the quantity of resin, the luminous intensity has a light increase gradually, but when the quantity of resin continues to increase, the luminous intensity revealed a trend of gradual decline, but overall change is not big. When the quantity of resin is 11%, the luminous intensity of ink is biggest. So the quantity of resin is not the main factor about influencing the luminous intensity of ink, but the quantity of resin is too big to benefit Fluorescent material produce fluorescence. In addition, the quantity of resin increases the viscosity of ink increases. According to viscosity requirements in the industry standards of inkjet printing ink, when the quantity of resin is 16%, the viscosity of ink is too high to apply inkjet press. All in all, the optimal quantity of resin is 11%.

3.2 The effect of the different quantity of resin on the surface tension of Fluorescent inkjet ink

The surface tension of the ink samples above are tested, as show in figure3. From this chart, the effect of the different quantity of resin on the surface tension of Fluorescent inkjet ink is less. Surface tension is the important property of inkjet ink, which directly affects the ink jet from the nozzles successfully. The surface tension of inkjet ink should fit the requirement of the inkjet press, and avoid appearing line break or having spilth around nozzle[3]. Because the surface tension has a little change, the quantity of resin 11% is still the best choice.

3.3 The printing proof

The ink is prepared by resin R2 and the quantity 11%, and the printing proof is obtained by using inkjet press and this ink, as show in figure4. Fluorescence inkjet ink sample can be print successfully, and has good stability, and the printing quality of the proof is better.

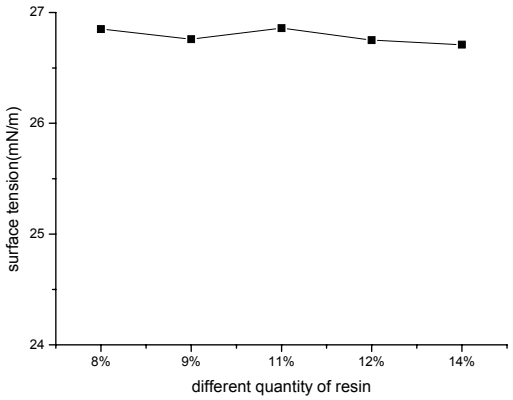

Figure3. The effect of the different quantity of resin on the surface tension of Fluorescent inkjet ink

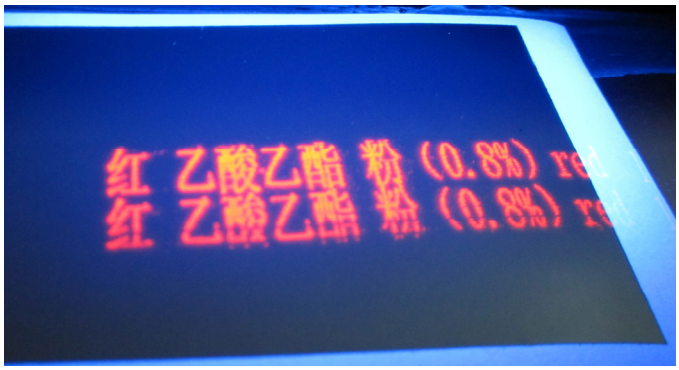

Figure4. The printing proof of Red Fluorescent inkjet ink

4. Conclusion

(1) The different resin serious affects the luminous intensity of Fluorescent inkjet ink, and the ink prepared by R2(acrylic resin 8) has the highest luminous intensity

(2) The effect of the different quantity of resin on the luminous intensity of Fluorescent inkjet ink is not big, according the requirement of viscosity, and the optimal quantity is 11%.

(3) The different quantity of resin has a light effect on the luminous intensity of Fluorescent inkjet ink.

References

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Author Biography

She is a teacher in Printing and Packaging Engineering Department, Beijing Institute of Graphic Communication. The direction of research is mainly on UV-curable inkjet ink and Fluorescent inkjet ink.